

HW 10

RGB LED Controller VHDL

EELE 467

Due date: 11/13/2024

In this assignment, you'll create an RGB LED controller using the PWM controller you created in HW 8. Controlling an RGB LED is part of your final project. Figure 1 shows an overview of the system architecture.

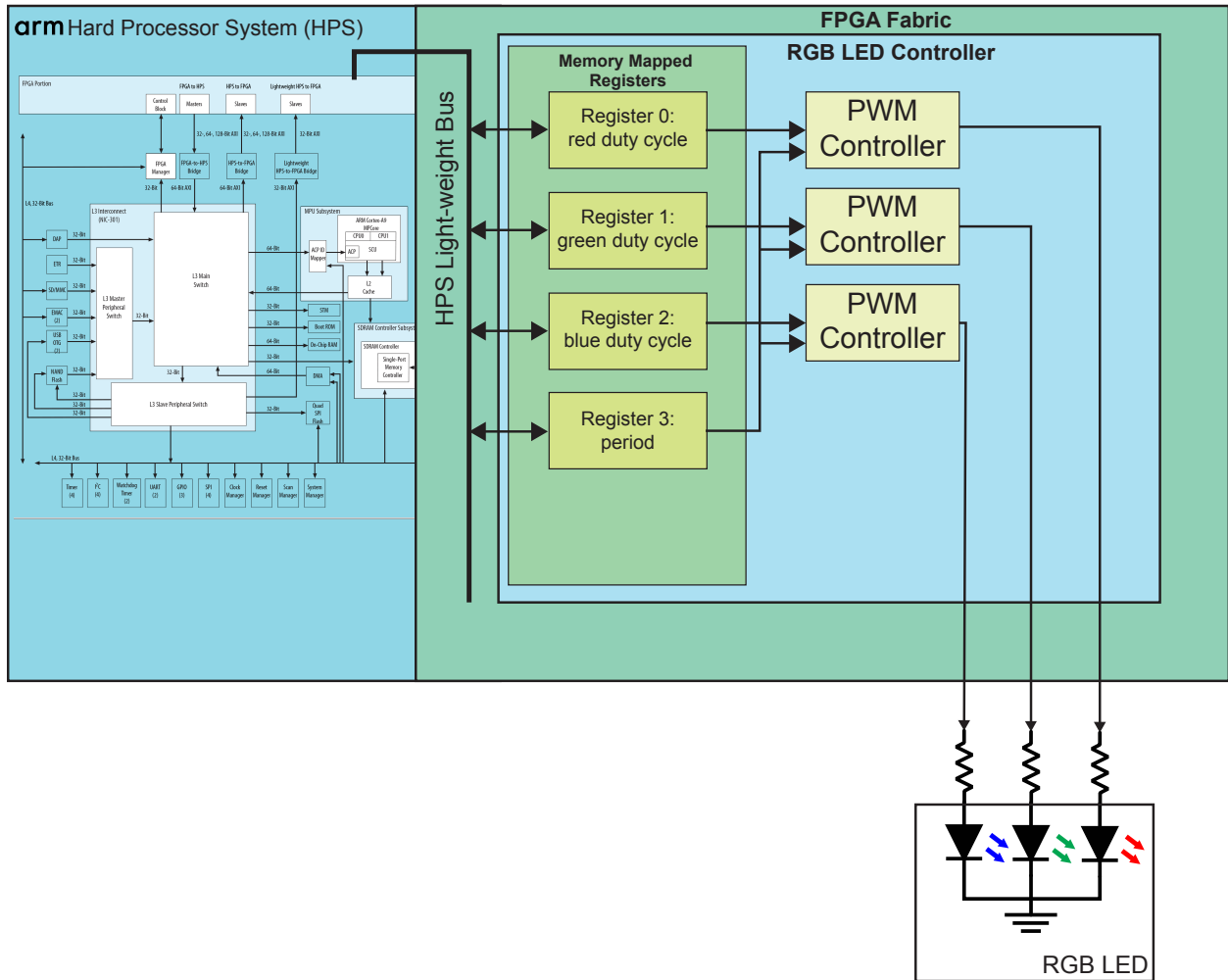


Figure 1: RGB LED Controller system architecture. The RGB LED Controller instantiates three PWM controllers: one for each channel. Registers control the duty cycle for each channel and the PWM period.

The color LED is a common cathode LED that has the following properties:

- **Red:** 620nm-625nm, Forward voltage: 2V-2.2V
- **Green:** 520nm-525nm, Forward voltage: 3V-3.2V
- **Blue:** 460nm-465nm, Forward voltage: 3V-3.2V

Requirements

Requirement 1: Create the RGB LED controller VHDL and Platform Designer component:

- Instantiate three PWM controllers, one for each LED color.
- Create separate duty cycle registers for each LED color.
- Create a single register for the PWM period.
- Export signals for the red, green, and blue PWM output signals.
- Use the base address listed in Table 1 as your component's base address.

Requirement 2: Calculate what current limiting resistors you need for the LED based on the I/O pin source voltage and forward voltages of the color LEDs. Assume a max current of 20 mA.

Requirement 3: Wire up this circuit and connect it to the GPIO pins that you selected at the top level in your VHDL code.

Requirement 4: Using System Console, create the following images showing your working system:

Picture 1: show your LED with a color of red ●

Picture 2: show your LED with a color of green ●

Picture 3: show your LED with a color of blue ●

Picture 4: show your LED with a color of your choice 🌈

Table 1: Assigned base addresses.

Last Name	First Name	Base Address
Allick	Kristoffer	0x1EC7D0
Almnaiee	Jasem	0x0025F0
Binfet	Caleb	0x18CBF0
Buckley	Peter	0x1A2730
Calvin	Jessica	0x1BCC20
Crittenden	Ian	0x02B3A0
Culwell	Joshua	0x0CCAD0
Currie	Drew	0x0850B0
Dupuis	Ryan	0x1999C0
Gill	Nicholas	0x0DCDE0
Girardot	Colter	0x1D2370
Graham	James	0x05D190
Guentherman	Zachary	0x0870E0
Hexom	Jordy	0x04A820
Holmes	Riley	0x045A80
Howard	Seth	0x1BD060
Hughes	Jonathon	0x128C50
Jensen	David	0x1197D0
Jones	Kaleb	0x04A340
Kaiser	Dirk	0x1B4B00
Kirkland	Grant	0x13E710
Lewis	Zane	0x0B3A80
McLean	Aaron	0x106BD0
Netz	Noah	0x0CDB00
Osborne	Emmett	0x026E30
Raber	Dylan	0x07AD00
Schwartz	Emily	0x03F200
Vincent	Kenneth	0x05E240
Wilcox	Joshua	0x07AD40
Wurden	Nicholas	0x0D5970

Deliverables

Submit your assignment using the workflow that's detailed at `docs/workflow.md` and the submission template at `docs/submission-template.md`.

- Commit all the code you wrote, etc.
- Put the resistance calculations in your markdown file. Use LaTeX to [format your equations and calculations](#).
- Add the pictures you took to your markdown file.